

DT04 Rec'd PCT/PTO 28 SEP 2004

Amendments to the Claims:

*This listing of claims will replace all prior versions, and listings, of claims in the application:*

1. (Original) A cross-linkable and/or cross-linked nanofiller composition which comprises a cross-linkable and/or cross-linked ethylene (co)polymer and an intercalated nanofiller.

2. (Original) A composition according to claim 1, in which the ethylene (co)polymer is selected from polyethylene and ethylene based alkene or alphaolefin copolymers.

3. (Currently Amended) A composition according to claim 1 ~~or claim 2~~, in which the ethylene (co)polymer is high density polyethylene (HDPE), medium density polyethylene (MDPE), linear low density polyethylene (LLDPE), low density polyethylene (LDPE), very low density polyethylene (VLDPE), ultra low density polyethylene (ULDPE), an ethylene hexene copolymer, an ethylene octene copolymer, a butylene (co)polymer, an ethylene-propylene copolymer (EPM), an ethylene-propylene-diene terpolymer (EPDM), an ethylene-butylene copolymer (EBM) or terpolymer (EBDM), an ethylene-vinylsilane (co)polymer, a copolymer or terpolymer of ethylene with acrylic acid (EA) or ethylene with ethylene acrylate and acrylic acid (EAA) or methacrylic acid (EMA) and/or a copolymer of ethylene with ethylacrylate (EEA), butyl-acrylate (EBA) or vinyl acetate (EVA).

4. (Original) A composition according to claim 3, in which the butylene (co)polymer is polybutylene or polyisobutylene.

5. (Currently Amended) A composition according to ~~any one of claims 1 to 4~~ claim 1, in which the ethylene (co)polymer is in the form of a metallocene catalyst ethylene (co)polymer.

6. (Currently Amended) A composition according to ~~any one of claims 1 to 5~~ claim 1, in which the ethylene (co)polymer or part thereof is grafted with compounds containing carboxylic acid or anhydride group(s).

7. (Original) A composition according to claim 6, in which the carboxylic acid or anhydride group is maleic anhydride or acid or fumaric anhydride or acid.

8. (Currently Amended) A composition according to claim 6 ~~or claim 7~~, in which the grafted ethylene (co)polymer is a maleic anhydride (MAH) or maleic acid grafted copolymer.

9. (Original) A composition according to claim 8, in which the maleic anhydride (MAH) or maleic acid grafted copolymer is LDPE-MAH, LLDPE, HDPE-MAH, EP-MAH, EPR-MAH, PE-MAH or PP-MAH.

10. (Currently Amended) A composition according to ~~any one of claims 1 to 9~~ claim 1, in which the ethylene (co)polymer contains polar group(s).

11. (Original) A composition according to claim 10, in which the polar group(s) are carboxylic group(s), maleic group(s) and/or ester group(s).

12. (Currently Amended) A composition according to claim 10 ~~or claim 11~~, in which the amount of (co)polymer with polar group(s) is about 0.01% of the total (co)polymer.

13-14. (Cancelled)

15. (Currently Amended) A composition according to ~~any one of claims 10 to 14~~ claim 10, in which the amount of (co)polymer with polar group(s) is at least about 8% of the total (co)polymer.

16. (Original) A composition according to claim 3, in which the ethylene content of the ethylene-propylene copolymer is about 10 to about 99.9% by weight.

17. (Cancelled)

18. (Currently Amended) A composition according to ~~any one of claims 3, 16 and 17~~ claim 3, in which the ethylene content of the ethylene-propylene copolymer is about 75 to about 99.9% by weight.

19. (Original) A composition according to claim 3, in which the vinyl acetate content of the ethylene-vinyl acetate copolymer (EVA) is about 3 to about 80% by weight.

20. (Cancelled)

21. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the ethylene (co)polymer is a plastomer or an elastomer.

22. (Original) A composition according to claim 21, in which at least about 40% to about 50% by weight of the total weight of (co)polymer is a plastomer with the balance being an elastomer.

23. (Cancelled)

24. (Currently Amended) A composition according to ~~any one of claims 21 to 23~~ claim 21, in which the plastomer is HDPE, MDPE, LDPE, LLDPE, VLDPE, EVA with up to about 30% vinyl acetate, EPM with up to about 25% propylene and/or an ethylene octene copolymer with S.G. of at least about 0.887.

25. (Currently Amended) A composition according to ~~any one of claims 21 to 24~~ claim 21, in which the elastomer is an ethylene octane copolymer with a S.G. of up to about

0.887, an ethylene hexene copolymer, ULDPE, ethylene propylene copolymer, an ethylene vinyl acetate copolymer with greater than about 38 % vinyl acetate, EPDM, EPM, and/or EPR.

26. (Original) A composition according to claim 25, in which the ethylene propylene copolymer is a terpolymer with a propylene co-monomer of greater than about 30 %.

27. (Currently Amended) A composition according to claim ~~[[35]]~~ 25, in which the vinyl acetate content for plastomeric EVA is about 9 to about 30 % by weight.

28. (Original) A composition according to claim 25, in which the vinyl acetate content for elastomeric EVA is about 38 to about 50 % by weight.

29. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the cross-linkable and/or cross-linked ethylene (co)polymer forms at least about 40% by weight of the total weight of (co)polymer.

30. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the nanofiller has particle(s) in the order of size of less than 50nm.

31. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the thickness of the nanofiller particles is about 1nm to about 100nm.

32. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the diameter or length or width of the nanofiller is up to about 500nm.

33. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the layers of the nanofiller are composed of silicate.

34. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the nanofiller is intercalated with an organic intercalatent.

35. (Original) A composition according to claim 34, in which the organic intercalant is an ionic or polar compound(s).

36. (Original) A composition according to claim 35, in which the ionic or polar compound(s) is a quaternary ammonium salt.

37. (Original) A composition according to claim 36, in which the quaternary ammonium salt is an optionally substituted long chain hydrocarbon quaternary ammonium salt.

38. (Original) A composition according to claim 37, in which the optionally substituted long chain hydrocarbon quaternary ammonium salt is a benzyl or alkyl substituted long chain hydrocarbon quaternary ammonium salt, an alkyl substituted tallow or hydrogenated tallow quaternary ammonium salt and/or a bis-hydroxyethyl quaternary ammonium salt.

39. (Currently Amended) A composition according to ~~any one of claims 36 to 38~~ claim 36, in which the counter anion for the quaternary ammonium cation is a halide or methyl sulphate.

40. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the nanofiller is an intercalated mineral nanofiller or clay which is either synthetic or natural and has been intercalated by organic modification with ionic or polar substances.

41. (Original) A composition according to claim 40, in which the mineral or clay is montmorillonite, bentonite, smectite and/or phyllosilicate.

42. (Currently Amended) A composition according to claim 40 ~~or claim 41~~, in which the nanofiller is Cloisite, Nanofil, Tixogel or Kunipia.

43. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the amount of nanofiller is about 0.1 to about 15% by weight.

44. (Cancelled)

45. (Currently Amended) A composition according to claim 43 ~~or claim 44~~, in which the amount of nanofiller is about 2 to about 6% by weight.

46. (Currently Amended) A composition according to ~~any one of claims 35 to 45~~ claim 35, in which the amount of organic intercalatent is up to about 40% by weight of the nanofiller.

47. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, which further ~~comprises another~~ comprising a second filler.

48. (Currently Amended) A composition according to claim 47, in which the second filler is an inorganic and/or mineral filler.

49. (Currently Amended) A composition according to claim 47 ~~or claim 48~~, in which the second filler is an optionally calcined clay, talc, mica, kaolin, alkaline earth metal carbonate, and/or metal hydroxide.

50. (Original) A composition according to claim 49, in which the alkaline earth metal carbonate is calcium carbonate, magnesium calcium carbonate and/or hydrated basic magnesium carbonate.

51. (Original) A composition according to claim 49, in which the metal hydroxide is aluminum and/or magnesium hydroxide.

52. (Currently Amended) A composition according to ~~any one of claims 47 to 51~~ claim 47, in which the second filler is coated.

53. (Currently Amended) A composition according to claim 52, in which the second filler is coated with stearic acid, stearate, silane, siloxane and/or titanate.

54. (Currently Amended) A composition according to ~~any one of the preceding claims claim 1, which further comprises~~ comprising an organic silane grafted to the ethylene (co)polymer and/or intercalated into the nanofiller.

55. (Original) A composition according to claim 54, in which the organic silane is a vinyl silane and/or a long aliphatic hydrocarbon chain silane.

56. (Original) A composition according to claim 55, in which the vinyl silane is a vinyl alkoxy silane.

57. (Original) A composition according to claim 56, in which the vinyl alkoxy silane is vinyl-tris-methoxy-silane (VTMOS), vinyl-tris-methoxy-ethoxy-silane(VTMEOS), vinyl-tris-ethoxy-silane, vinyl-methyl-dimethoxy-silane and/or gama-methacryl-oxypopyl-tris-methoxy-silane.

58. (Currently Amended) A composition according to ~~any one of claims 55 to 57~~ claim 55, in which the vinyl silane is added in an amount from about 0.5 to about 2% by weight.

59. (Cancelled)

60. (Currently Amended) A composition according to claim 58 ~~or claim 59~~, in which the vinyl silane is added in an amount of about 1% to about 1.8% by weight.

61. (Currently Amended) A composition according to ~~any one of claims 54 to 60~~ claim 54, in which the organic silane is grafted using a free radical initiator.

62. (Original) A composition according to claim 61, in which the free radical initiator is a peroxide.

63. (Original) A composition according to claim 62, in which the peroxide is dicumyl peroxide, di-tertiary-butyl peroxide, di-tertiary-butyl-cumyl peroxide and/or bis-tertiary-butyl-cumyl peroxide.

64. (Currently Amended) A composition according to ~~any one of claims 61 to 63~~ claim 61, in which the free radical initiator is added in an amount of about 0.05 to about 0.3% by weight.

65. (Cancelled)

66. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, in which the composition and/or ethylene (co)polymer are silane cross-linked, cross-linked by adding a cross-linking catalyst or radiation cross-linked.

67. (Currently Amended) A composition according to ~~any one of the preceding claims~~ claim 1, which further ~~comprises~~ comprising one or more ~~additives known in the art~~ of polymer processing additives.

68. (Original) A composition according to claim 67, in which the additive is an antioxidant, metal deactivator, copper inhibitor, UV absorber, foaming or blowing agent which is either endothermic or exothermic, processing and/or thermal stabiliser, pigment, flame retardant, extender, plasticiser and/or softener.

69. (Original) A process for preparing a cross-linkable and/or cross-linked nanofiller composition which comprises either:

- (a) mixing and delaminating and/or exfoliating in one step a cross-linkable and/or cross-linked ethylene (co)polymer and an intercalated nanofiller;
- (b) mixing a cross-linkable ethylene (co)polymer with an intercalated nanofiller; and delaminating and/or exfoliating at least part of the nanofiller; or
- (c) delaminating and/or exfoliating at least part of an intercalated nanofiller; and



mixing the delaminated and/or exfoliated intercalated nanofiller with a cross-linkable and/or cross-linked ethylene (co)polymer.

70. (Original) A process according to claim 69, in which the ethylene (co)polymer and/or nanofiller are subjected to grafting either before, during or after the mixing and/or exfoliating and/or delaminating step(s).

71. (Original) A process according to claim 70, in which the grafting involves treating the ethylene (co)polymer and/or nanofiller with an organic silane which is then grafted onto the (co)polymer and/or intercalated into the nanofiller.

72. (Original) A process according to claim 71, in which the organic silane is grafted using a free radical initiator.

73. (Currently Amended) A process according to ~~any one of claims 69 to 72~~ claim 69, which further ~~comprises~~ comprising the step of cross-linking the (co)polymer after step (a) or cross-linking the composition after step (b) or (c).

74. (Original) A process according to claim 73, in which the composition and/or ethylene (co)polymer is silane cross-linked, cross-linked by adding a peroxide cross-linking catalyst, silane cross-linked or radiation cross-linked.

75. (Currently Amended) A process according to ~~any one of claims 69 to 74~~ claim 69, in which the (co)polymer is granulated, pelletised, powderised, cut and/or diced.

76. (Currently Amended) A process according to ~~any one of claims 69 to 75~~ claim 69, in which the (co)polymer and the nanofiller are pre-mixed or added simultaneously, sequentially and/or separately to a mixing apparatus.

77. (Currently Amended) A process according to ~~any one of claims 69 to 76~~ claim 69, in which the nanofiller or composition are exfoliated and/or delaminated using high shear processing.

78. (Currently Amended) A process according to ~~any one of claims 69 to 77~~ claim 69, in which a further exfoliation and/or delamination step is performed at any stage of the process.

79. (Currently Amended) A process according to ~~any one of claims 69 to 78~~ claim 69, in which other fillers and/or additives are added simultaneously, sequentially and/or separately at any step of the process.

80. (Original) A process according to claim 79, in which the (co)polymer, nanofiller, other fillers and/or additives are dry or dried in a separate step prior to step (a).

81. (Currently Amended) An article which is wholly or partly composed of the nanofiller composition defined in ~~any one of claims 1 to 68~~ claim 1.

82. (Original) An article according to claim 81, which is a profile, tube, pipe, film, sheet, tile, floor covering, container or packaging for food.

83. (Currently Amended) A process for preparing the article defined in claim 81 ~~or claim 82~~, which comprises a step selected from the group consisting of either:

(a) forming or shaping the nanofiller composition defined in ~~any one of claims 1 to 68~~ claim 1; [[or]]

(b) combining at least one layer of the nanofiller composition defined in ~~any one of claims 1 to 68~~ claim 1 with at least one other polymeric layer;

(c) cross-linking the nanofiller composition defined in ~~any one of claims 1 to 68~~ claim 1; [[or]] and

(d) heating and stretching the nanofiller composition defined in ~~any one of claims 1 to 68~~ claim 1 and cooling the stretched composition.